MULTILEVEL ADAPTIVE MESH REFINEMENT FOR STRUCTURED ALE HYDRODYNAMICS

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A new family of algorithms that combine staggered grid arbitrary Lagrangian-Eulerian (ALE) techniques [1, 4, 3] with structured local adaptive mesh refinement (AMR) [2] has been developed for solution of the Euler equations. The novel components of the methods are driven by the need to reconcile traditional AMR techniques with the staggered variables and moving, deforming meshes associated with Lagrange based ALE schemes. Established ALE methods are examined in the AMR context and some limitations with respect to conservation properties are identified, which motivates some alternative ALE formulations. Prototypical elliptic mesh relaxation schemes are extended for use within the context of an space- and time-adaptive mesh hierarchy. Numerical examples are used to highlight the utility and efficiency of the method over traditional single-grid ALE solution methods, for example in the calculation of shock-driven instabilities as shown in Figure 1.

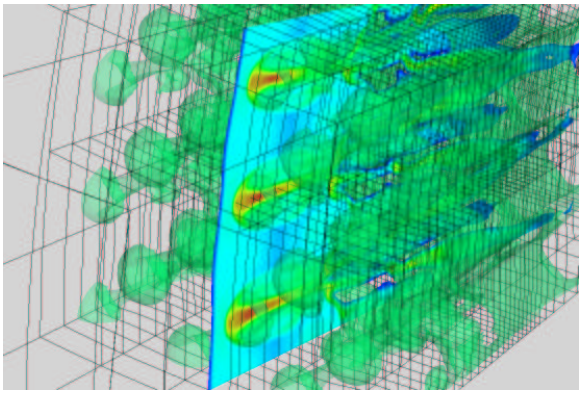

Figure 1: Richtmeyer-Meshkov Instability in an ICF Model Problem using ALE-AMR.

References

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